

The Reliquary and Illustrated Archaeologist. Edited by Rev. Dr. J. Charles Cox. New series, Vol. xiv. Pp. 302. (London: Bemrose and Sons, Ltd., 1908.) Price 12s. net.

THE quarterly numbers of this review are often noticed separately in these columns on their appearance. The *Reliquary* is devoted to the study of the early pagan and Christian antiquities of Great Britain, mediæval architecture and ecclesiology, the development of the arts and industries of man in the past ages, and the survivals of ancient usages and appliances in the present. The volume for the present year contains an abundance of interesting text and excellent illustrations, and should appeal to a wide circle of readers interested in antiquities.

The Class-room Atlas of Physical, Political, Biblical, and Classical Geography. Edited by E. F. Elton. Third edition, revised. Pp. vii + 48, plates + 11. (Edinburgh and London: W. and A. K. Johnston, Ltd., 1908.) Price 5s. net.

THIS widely known atlas has undergone a thorough revision, and may be recommended to the careful attention of teachers in schools where geography is regarded as a school subject of great educational value. The editor has been successful in his aim of providing clear maps, a full treatment of physical features, and a series of climate charts which will meet school requirements adequately.

Flashes from the Orient, or a Thousand and One Mornings with Poesy. In Four Books: Spring, Summer, Autumn and Winter. Book second—Summer. By John Hazelhurst. (London: Hazell, Watson and Viney, Ltd., 1908.) Price 1s. 6d.

MR. HAZELHURST draws the inspiration for most of his verse from natural objects and phenomena, but occasionally current events, incidents relating to people of the day, and moral questions form the subjects of his sonnets. There are many evidences of the author's versatility in the 295 pieces the book includes, and his imagination and grace will please many readers.

The Country Home. Vol. i., May to October, 1908. Pp. ii + 380. (London: Archibald Constable and Co., Ltd., 1908.) Price 5s. net.

THE first volume of this very attractive magazine, containing the monthly numbers one to six, is likely to become a popular book in country houses. Nature-study takes a prominent place in the comprehensive table of contents, and much attention is given to horticulture and other suitable pursuits for country dwellers. The illustrations are numerous and good.

LETTER TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Objective Demonstration of the Rotation of the Plane of Polarisation of Light by Optically Active Liquids.

SOME years ago a method was described by N. Umow (*Zeitschrift für physikalische Chemie*, 1899, xxx., 711) for demonstrating objectively the rotation of the plane of polarisation of light by an optically active liquid such as a solution of sugar. The method was an ingenious application of Tyndall's experiment on the effect of an opalescent liquid on a beam of polarised light. It consisted in rendering a concentrated solution of sugar somewhat turbid by adding to it a small quantity of an alcoholic solution of resin; on passing an intense beam of plane polarised light into this solution spirals of light of the spectrum colours were seen round the walls of the tube, the colours being, of course, due to rotation dispersion.

Some time ago, in order to show this phenomenon, I

made a slight modification of Umow's method in regard to the solution, which appeared to be advantageous. A concentrated solution of sugar was mixed with arsenious oxide, and when as much of the latter had dissolved as possible, the liquid was filtered, and sulphuretted hydrogen gas passed through the filtrate. This gave a clear solution of sugar and colloidal arsenious sulphide, and when an intense beam of plane polarised light was passed into such a solution the phenomenon described by Umow was very clearly seen, although some of the colours were slightly interfered with by the yellow colour of the solution.

For the purposes of a popular lecture I recently prepared a colloidal solution in water of arsenious sulphide alone—to exhibit the Tyndall effect—and another as above described, but I also filled a third tube with a solution of sugar in water (made with tap-water and filtered through ordinary filter paper). I proposed to point out that a beam of plane polarised light passed through this last tube should produce no effect, as the tube contained a true solution.

On trying the experiment beforehand, however, I was surprised to find that the colours were nearly as distinct as, and certainly purer than, in the case of the solution which contained arsenic sulphide. It thus appears that in order objectively to demonstrate optical rotation nothing further than a clear aqueous solution of sugar is necessary, and that Umow's addition of resin and mine of arsenious sulphide were superfluous.

It seems highly probable that the simple experiment of passing a beam of plane polarised light sufficiently intense to show the phenomenon can never have been made before, otherwise the experimenter could not have failed to be struck by the colours produced.

As regards explanation, there seem to be two possibilities:—(1) there may be in the solution containing sugar and water a small quantity of foreign matter, either in the colloid form or in such a fine state of subdivision as to pass through the filter paper, these particles, as in Tyndall's and in Umow's experiment, scattering light and thus showing up the rotation; or (2) the spirals may be due to scattering of light by the sugar molecules themselves, which thus serve to show up their own rotation. The decision must be left to those competent to discuss the question. I will only mention in support of the first suggestion that when a beam of ordinary light is passed through the aqueous sugar solution slight scattering of the light certainly occurs, as is shown by examination of the light coming from the sides of the tube, by means of a Nicol prism. On the other hand, however, the colours seen in the tube containing sugar and water alone are but little inferior in intensity to those seen in the tube containing arsenious sulphide.

I have also passed a beam of plane polarised light through a tube containing a very pure specimen of menthyl acetate ($[\alpha]_D^{16.6} = -79.5$) which had been carefully distilled. The colours were quite apparent in this case also, being purer, but not so intense as with the sugar solution. The scattering of ordinary light by the menthyl acetate was very slight indeed.

Whatever the cause of the phenomenon may be, it is a very simple matter to demonstrate objectively to a large audience the rotation of the plane of polarisation of light.

T. S. PATTERSON.

Organic Chemistry Laboratory, University of Glasgow, December 18.

THE FINANCIAL STATUS OF THE UNIVERSITY PROFESSOR.¹

THE Carnegie Foundation for the Advancement of Teaching was instituted for the betterment of the calling of the teacher in the United States, the Dominion of Canada, and Newfoundland. Its first

¹ "The Financial Status of the Professor in America and in Germany." Bulletin No. 2. (New York: The Carnegie Foundation for the Advancement of Teaching, 1908.)

"The Relations of Christian Denominations to Colleges." An Address before the Conference on Education of the Methodist Episcopal Church, South, at Atlanta, Ga., May 20, 1908. By Henry Pritchett, President of the Carnegie Foundation. (Printed at Nashville, Tennessee, 1908.)

purpose has been to establish an efficient system of retiring pensions for professors in the higher centres of learning. Up to May, 1908, sixty colleges and universities had been admitted to the benefits of its retiring allowance system, and one hundred and six professors and eighteen widows of professors are already receiving allowances amounting in the aggregate to more than 37,000*l.*

A natural sequel to this first important task has been the collection of statistics relating to the salaries of the American professors, and a comparison of the figures with those prevailing in Germany. The report which has been drawn up contains an introduction by Mr. Henry S. Pritchett, president of the foundation, while the arrangement and analysis are due to Prof. E. L. Thorndike, of Teachers' College, and Messrs. John G. Bowman and Monell Sayre, representing the Carnegie Foundation. For the data concerning the German professor, Dr. A. A. Snowden is responsible.

We learn from the report that there are about 1000 institutions in the United States and Canada bearing the title "college" or "university." A great many of these, however, do not rise above the rank of indifferent high schools; roughly speaking, nearly one-half of them are not colleges in any true sense, and the pay of their teachers is proportionately small. As it would be unfair to draw conclusions from these institutions regarding the average pay of the teacher of real distinction, the committee has based its conclusions mainly on information derived from the 102 institutions in the United States and Canada which appropriate annually more than 9000*l.* for the total payment of the salaries of their instructing staffs. The tables indicate that in these institutions the salary of a full professor ranges generally from about 270*l.* to 960*l.* per annum, and that the average is about 500*l.* It is pointed out that the variations in salary correspond to some extent with differences in cost of living, and that while a salary of 400*l.* may be a comfortable one in a small town in the middle west of America, double that salary may not secure equal advantages in New York. It appears that all the salaries below 300*l.* are paid either at colleges where living is comparatively inexpensive, or they are paid under exceptional conditions, in addition to free rooms and board.

From an examination of the corresponding figures for associate professors and assistants, Mr. Pritchett concludes that an American who has taken a post-graduate course and prepared himself for the profession of higher teaching may hope to obtain 250*l.* at the age of twenty-eight, 270*l.* at thirty-one, 450*l.* at thirty-three, and 500*l.* at thirty-five. The report also discusses the details at fifty-four of the most important institutions, where the total annual expenditure varies between 2000*l.* and 9000*l.* It is found that though several of these institutions are doing excellent work as "colleges," it is practically impossible for a "university" to exist and do good work under 9000*l.* a year. The scholarly atmosphere maintained at some of the smaller institutions is in direct relation to the relatively high salaries they pay their teachers.

There are very few large prizes in the teaching profession. In only two or three colleges does the salary rise above 1000*l.*, and it would appear that in several instances those drawing this salary have been appointed under conditions which have since been modified.

Mr. Pritchett is keenly alive to the need for bettering the position of the university teacher. It is pointed out that the professor can never expect to earn the large income which is the reward of enterprise and ability in such learned professions as medicine and law. The attraction which leads able men into the

teacher's calling springs from two sources, first, the sense of power and responsibility which the true teacher feels; secondly, the love of study and of the scholar's life. Held in a position of highest dignity by those about him, he lives a life of frugality, of simplicity, of influence, and, above all, of happiness. He lives, as Mr. Lowell observed, in the only recognised aristocracy in America. A man who chooses this calling should be freed from financial worries. A salary below the line of comfort means a struggle to live and educate the children of the family. Probably there are very few professors in any country who do not utilise their salaries to the best advantage by living the simple life, so that when the financial worries come the sacrifice takes the form of abandonment of research and the undertaking of outside work, often remunerated at a rate which makes but a poor return for the demands it imposes on the professor's time. The need of opportunity for research is strongly emphasised by Mr. Pritchett. Another cause which is detrimental to scholarly productivity is the large amount of administrative and routine work frequently devolving on the teachers.

The second part of the report deals with Germany. The committee finds that the German professor may expect in time a far greater financial and social reward than comes to his American colleague. He has, furthermore, a place of far greater security, and with full protection for his old age and for his wife and children. On the other hand, he has to go through a longer period of probation than the American before attaining the coveted chair. A German who possesses such ability that he may expect in due time to become a full professor, and who prepares himself for university teaching, must expect to study until the age of thirty with no financial return, to study and teach as a privat-docent until nearly thirty-six, with an annual remuneration of less than 40*l.*, and to teach from thirty-six to forty-one with an annual remuneration of from 120*l.* to 400*l.*, by which time he may become a full professor and will continue to receive his salary until his death.

The committee is very strongly of opinion that the low scale of salaries of American professors is in no small measure due to the multiplication of weak and unnecessary colleges, and also to the tendency to expand the curriculum over an enormous variety of subjects without regard to thoroughness. A college of ten professors who are strong teachers, commanding fair compensation and teaching only such subjects as they can teach thoroughly, is, as Mr. Pritchett points out, a far better centre of intellectual life than a college which seeks with the same income to double the number of professors and to expand the curriculum to include in a superficial way the whole field of human knowledge. In many instances given in this bulletin the low grade of college salaries is due to the attempt to maintain a university with an income which is adequate only to the maintenance of a good college.

In regard to the multiplication of classes, it is pointed out, in so many words, that as a rule neither the professors nor the president of a university college are fighting business men. When it comes to a question of asking for more money, they are by nature diffident of placing their own personal claims in the foremost position, and they adopt the "path of least resistance" by associating their demand with some desirable extension of the teaching work of their institution. They hope all along that their own candle will be relieved from the pressure of the bushel which dims its luminosity. But, unfortunately, they

too often adopt a course which has the reverse effect by exhausting the funds which might be theirs if they only asserted themselves with a little more push. It is this fact which has led to a result, not peculiar in any way to American universities, that the salaries of professors often decrease in direct measure as the success of their college or university increases. If Mr. Pritchett had carefully studied the universities of Great Britain he might have found some notable instances in our own country. Meanwhile the professor himself makes strenuous efforts to reduce his butcher's or tailor's bill, and if he succeeds it too often happens that his influence as a leader of thought is impaired in consequence. As the committee puts the matter, he does not feel quite justified in demanding a greater salary for himself, even though he is wasting the university's energy in copying quotations, building fires, and hunting about the town for a cheap tailor. A course is given, though only five out of a thousand students take it, and though these five would probably be as much profited by some other course already offered. Yet to give that course is to withhold an increase of twenty or twenty-five per cent. to some individual's salary. It is pointed out that in many things institutions might profitably cooperate. There does not seem, for example, any necessity for two universities in the same city to give courses in Syriac.

The problem which this consideration presents is thus stated on p. 52 of the Bulletin. Given a certain sum for salaries for a university or college of a given size, how much must be sacrificed in the quality of the teachers in order to have enough teachers? If all the conditions of the problem were capable of exact numerical representation, this would be a simple problem in maxima and minima, but in view of the difficulty of translating the data into mathematical language, we may be at least satisfied with the committee's recommendation that one 600l. man teaching a class of thirty-six students probably means better progress than two 300l. men each teaching eighteen of the thirty-six.

Turning to the question of multiplication of colleges, an important factor in America has been the foundation of a large number of educational institutions associated more or less directly with certain Christian denominations. These colleges form the subject of Mr. Pritchett's address before the Methodist Episcopal Conference at Atlanta. Colleges which are under the control of a sect, or which require their trustees, officers, or teachers to belong to a specified denomination, are excluded from the benefits of the Carnegie Foundation. Mr. Pritchett pays a high tribute to the work which many of these institutions have done in the pioneer days of American education, but points out the great increase which has taken place in recent years in the expense of maintaining a genuine college on efficient lines, and finds that during the last two decades Christian denominations have found increasing difficulty in meeting those obligations, and the colleges controlled by them have with few exceptions received a meagre and inadequate support. There are three positions which a Christian denomination may take up in regard to education. First, it may say that the maintenance of colleges is necessary for extending and continuing the influence and power of the Church in question. Under this view the responsibility of providing the funds rests with the Church itself. From the statistics given in the paper it is shown that the salaries which denominational colleges provide for their teachers even in the most favourable cases compare very badly with those prevailing in institutions under State or independent control. A further objection to the system is the

burden which it imposes on the ministry of begging money for the Church college. It is clear that under such a system burdens have been imposed on the churches which they cannot efficiently bear at the present time. The second view is that a church may claim the right and duty to control educational institutions on the ground of religious fitness. But it is pointed out that the maintenance of sectarian tests does not, as a rule, conduce to the religious fitness of a college; indeed, it has often resulted in a serious lowering of standard, brought about by competition between colleges of rival denominations. The third method is for a religious body to accept openly the view that colleges and universities are furthering the cause of religion generally, and that the cause can best be advanced by a Church if it exerts its best influences on higher institutions in general without reference to sectarian control. Mr. Pritchett considers that such a solution is not only theoretically but practically possible, and that the abandonment of the spirit of partisanship will strengthen the churches by enabling them to appropriate to their own use in the training of their own men the facilities for general education provided in colleges.

On reading these publications we naturally wish that there was some body in England corresponding to the American Carnegie Foundation, the more so as the operations of that body extend to Canada as well as to the United States. The very success of the higher educational movement in Great Britain has too often resulted in a lowering of the professors' salaries. This is particularly unfortunate in a country where a continual struggle for the upper hand occurs between the scholarly ideal and the examination (shall we say?) ordeal. Examinations are not altogether bad in themselves; they test the student's powers of English composition, of expressing lucidly and intelligibly in writing the ideas which he has learnt. They should also test his resourcefulness in dealing at short notice with difficulties which have not been anticipated by the teacher. But the teacher whose tenure of office is at all insecure cannot but feel that in many instances his means of livelihood are more or less dependent on the outside show which his classes make when the numerical results of examinations are compared with those of other institutions. Thus, instead of devoting his spare hours to research, he is often led voluntarily to give private tuition to those members of his classes whose prospects of passing their examinations are doubtful. In other words, a premium is placed upon inferior scholarship. We have known of professors whose careers have been ruined by their too rigid insistence on high scholarship in contradistinction to high records of examination passes. Again, the need of retiring allowances for professors was never and nowhere more acutely felt than it is in Great Britain at the present day. That it should be possible for a Fellow of the Royal Society to be reduced to extreme poverty without even a Civil List Pension, after devoting the best years of his lifetime to the interests of a college, doing the work of perhaps five professors in a German university for a salary far below the line of comfort, is an occurrence of which our country cannot feel proud. To make things worse, this sad misfortune may not improbably have been the result of overwork in undertaking additional administrative duties for the college in a period of emergency. If the Carnegie Foundation does no more for America than prevent the occurrence of such cases its existence will be fully justified, but it would be a great relief to some of us on this side of the Atlantic if a similar institution could be charged with the interests of the higher teachers in Great Britain.

G. H. B.